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EXAMINER	
KEMMERLE III, RUSSELL J	
ART UNIT	PAPER NUMBER
1791	

NOTIFICATION DATE	DELIVERY MODE
01/21/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PATDOCTC@fr.com

Office Action Summary	Application No.	Applicant(s)	
	10/523,345	ALTHOFF ET AL.	
	Examiner	Art Unit	
	RUSSELL J. KEMMERLE III	1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 October 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3 and 5-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3 and 5-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 112

Claims 1-3 and 5-13 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. This rejection is maintained from the previous Office action mailed 9 July 2008 and is maintained here. Applicant's comments regarding this are addressed below in the "Response to Arguments" section.

Claim 6 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. In the current case the use of a second ceramic material having a relative permittivity ε_2, where $18 \leq \varepsilon_2 \leq 22$ is found to not be enabled.

The standard used to determine if an invention is enabled by the specification is if the experimentation needed to practice the invention undue or unreasonable. *In re Wands*, 858, F.2d 731, 737, 8 USPQ 1400, 1404 (Fed. Cir. 1988). There are many factors to be considered when determining whether there is sufficient evidence to support a determination that a disclosure does not satisfy the enablement requirement

and whether any necessary experimentation is "undue". These factors include, but are not limited to:

a) The breadth of the claims;

b) The nature of the invention;

c) The state of the prior art;

d) The level of one of ordinary skill;

e) The level of predictability in the art;

f) The amount of direction provided by the inventor;

g) The existence of working examples; and

h) The quantity of experimentation needed to make or use the invention based on the content of the disclosure. *Id.*

The Examiner has considered these factors as follows:

a) The claim is directed to a method of making a ceramic substrate comprising multiple layers, wherein at least two of the layers comprise different materials; a first ceramic material having a permittivity ε_1, where $7 \leq \varepsilon_1 \leq 8.5$; and a second ceramic material with a relative permittivity ε_2, where $18 \leq \varepsilon_2 \leq 22$; and is heated according to a specific heating profile. The breadth of the claim of interest to the current inquiry is the requirement of the second ceramic material have a relative permittivity ε_2, where $18 \leq \varepsilon_2 \leq 22$.

b) The nature of the invention is the manufacture of a ceramic substrate where at least one of the layers of the substrate is made of a ceramic material with a relative permittivity ε_2, where $18 \leq \varepsilon_2 \leq 22$.

c) The state of the prior art is that it was known to make similar ceramic substrates using a heating cycle which meets the current claim limitations, but using materials to make the layers which do not have a relative permittivity of 18-22 (for example; Herron, US Patent 4,627,160). Further, ceramic materials known to have a relative permittivity of 18-22 and useable in forming methods used to create the layers which form ceramic substrates (such as tape casting) do not appear to be known in the art.

d) The level of one of ordinary skill in the art does not lend itself as evidence to show the invention is not enabled.

e) The level of predictability in the art is such that one of ordinary skill in the art would understand the consequences of using materials having a different permittivity.

f) The amount of direction provided by the inventor is low. There is no indication or suggestion as to what ceramics might be useable for making a ceramic substrate

g) There is no working example provided where a specific material is disclosed, only an example using an unidentified material with a permittivity of about 20.

h) The quantity of experimentation needed to practice the invention cannot be precisely known, however, one of ordinary skill in the art would have to identify a ceramic material which could be used to make the layers used to form the substrate, and also have a permittivity ε where $18 \leq \varepsilon \leq 22$.

Given all of the above factors, it is deemed that claim 6 is not enabled, in that one of ordinary skill in the art would not know from the teachings of the specification and the prior art what ceramic materials could be used to make a layer for use in a ceramic substrate that would have a permittivity of 18-22. Courts have previously found that if certain chemicals are required to practice an invention, the application must provide a sufficient disclose of the apparatus if it is not readily available. Based on the searching done by the Examiner, ceramic materials which could be used in forming layers for a ceramic substrate do not appear to be readily known or available, and since no disclosure of such is present in the application, the making of a ceramic substrate using these materials is found to not be enabled.

Deleted:

Claim Rejections - 35 USC § 103

Claims 1, 2, 3 and 5-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Herron (US Patent 4,627,160).

Herron discloses a method of making a laminated ceramic substrate where a plurality of ceramic green sheets are laminated together, and subsequently fired. Herron discloses that the firing process involves several heating steps, including preheating to 200°C in a nitrogen environment, further heating to 450°C in a hydrogen/water environment, continuing to 785°C, and finally sintering in a nitrogen

environment at 965°C to sinter the substrates (see Examples I and II, Col 5 line 51 – Col 6 line 68). Herron specifically states that in heating to the sintering temperature there is no prior cooling of the sample (Col 6 lines 55-57). It should be noted that all heating steps described above are carried out in an inert atmosphere. Herron further discloses that this heating cycle is effective where the layers of the ceramic substrate are made of different ceramic materials (see, Example 1, Col 5 line 51-Col 6 line 46, specifically Col 6 lines 16-22).

While Heron does not disclose the relative permittivities of the materials used, it would have been obvious to one of ordinary skill in the art, at the time of invention by applicant, to use materials which satisfy the permittivity limitations of claims 1 and 6 in order to form a laminated ceramic substrate since the relative permittivities of the materials used is known to effect how well they operate as an insulator in the structure. The optimization of the permittivities in order to create a substrate having the desired level of insulation between layers would have been well within the ability of one of ordinary skill in the art, and would have had the predictable result of adjusting the insulating characteristics of the finished substrate. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955) (Claimed process which was performed at a temperature between 40°C and 80°C and an acid concentration between 25% and 70% was held to be prima facie obvious over a reference process which differed from the claims only in that the reference process was performed at a temperature of 100°C and an acid

concentration of 10%.); See also In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980) (prior art suggested proportional balancing to achieve desired results in the formation of an alloy).

Referring to claims 2 and 3, Herron further discloses that in forming the laminated stack via holes are opened in the ceramic green sheets, and that those holes are filed with an electrically conductive (i.e., metalliferous) paste, and that the paste is also used to form line patterns on the surface of the sheets (Claim 15).

It would be inherent that these layers would posses the relative sintering temperatures as recited in claim 5.

Referring to claims 7 and 8, Herron discloses that between these stratified layers, a metallization layer (i.e., an in line pattern) can be formed (see Claim 15).

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Herron in view of Nakatani (US Patent 5,252,519).

Herron is relied upon as discussed above. Heron further teaches that the electrically conductive paste to be used be a copper compound, and does not teach the use of a silver or silver-palladium containing paste.

Nakatani discloses a method for making a stacked ceramic substrate substantially similar to that of Herron. Nakatani discloses that the metal conductor paste used could include, among others, a silver-palladium mixture (Col 1 lines 26-28).

It would have been obvious to one of ordinary skill in the art, at the time of invention by applicant to have modified the method of Herron by using a silver-palladium paste as the metallic conductor as taught by Nakatani instead of the copper

compound taught by Herron. This would have been obvious because Nakatani discloses that such a paste is effective as a material for such use, and the advantageous electrical properties of silver-palladium are well known to those in the art.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Herron in view of Harada (US Published Application 2001/0,022,416)

Herron is relied upon as discussed above but does not teach that the heating process occurs in air.

Harada discloses a method of making a ceramic substrate, substantially similar to that of Herron. Harada further teaches that the heating processes for debinding and sintering are carried out in air (Page 3 paragraph 45) (it is assumed that since no firing environment is described that an air environment is used, since any other special environment would be affirmatively disclosed).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to modify the method taught by Herron of firing the ceramic substrate in an inert environment by firing in air as taught by Harada. This would be obvious because Harada discloses that such an environment is effective for firing, and an air environment is cheaper and easier to achieve that an inert environment since nothing has to be added to the firing environment.

Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable Herron in view of Harada and Tamhankar (US Patent 5,230,846)

Herron and Harada are relied upon as discussed above, but fail to teach that during debinding the environment is switched from inert to air (specifically the special case as recited in claim 13, or the firing cycle recited in claim 12).

Herron discloses the benefits of debinding in an inert environment, while Harada discloses the benefits of sintering in an air environment (as discussed above). However, they do not discuss starting with an invert environment of Herron, and switching to the air environment of Harada, specifically performing this switch during a reduction in the temperature from the maximum debinding temperature to a lower temperature that is equal to or greater than the starting debinding temperature.

Tamhankar discloses a method of firing a ceramic substrate substantially similar to that of Herron and Harada. Tamhankar discloses that during the firing cycle a first temperature is reached where debinding begins (T_{E1}, around 200°C), firing and debinding is then continued up to 500°C in a nitrogen/oxygen/water vapor environment. After a hold at 500°C (T_{E2}), the temperature is reduced to 485°C ($T_{E1'}$) while the firing environment is changed, during this time the environment is nitrogen/hydrogen/water vapor. Firing is then continued (with the temperature never dropping below T_{E1}, 200°C) to a sintering temperature in a nitrogen/water vapor environment (Fig 1).

It would have been obvious to one of ordinary skill in the art to modify the method taught by Herron of firing in an inert environment, by changing the environment after debinding to an air environment, since as taught by Harada an inert environment is not required after the debinding is completed and an air environment would be cheaper and easier to fire it. It would be further obvious that the change in environment could be

accomplished by the method taught by Tamhankar, which teaches an effective method of transitioning from one environment to another during firing without a substantial reduction in temperature at any point during the firing cycle.

Response to Arguments

Applicant's arguments filed 09 October 2008 have been fully considered but they are not persuasive.

Applicant's first argue that the limitation that the second ceramic material have a relative permittivity ε_2 which is at least two times as high as a relative permittivity of the first ceramic material ε_1. The argument is based on the specific disclosure found, for example, in claim 6 of $7 \leq \varepsilon_1 \leq 8.5$ and $18 \leq \varepsilon_2 \leq 22$. Applicant's argue that since the minimum value of ε_2 (18) is greater than twice the value of ε_1 ($8.5 \times 2 = 17$) that support is found for the limitation.

This is not found persuasive because this example does not provide support for the broader limitation recited in claim 1 that ε_2 is at least two times as high as ε_1. While specific examples given do fall within this limitation, the limitation also covers a great amount of area that falls outside of the disclosed example (for example, $\varepsilon_1 = 1$ $\varepsilon_2 = 3$). While support is found for a small range of examples which fall within the limitation that ε_2 is at least two times as high as ε_1, because current claim 1 covers so much which falls outside of the specific example of current claim 6 the specification as originally filed is not found to support the broader limitation.

Applicant's arguments with respect to the prior art rejections have been considered but are largely considered moot in view of the new ground(s) of rejection.

However, they will be addressed here in as much as they may apply to these new grounds.

Applicant argues that Herron does not disclose using layers comprised of different ceramic materials.

This is not found to be persuasive because the layers used in Herron do not contain the same list of materials. Some of the layers of Herron contain a second material, such as Cu_2O, while some do not. While all layers contain some of the same materials only some of the layers contain a "second" (or additional) ceramic (such as Cu_2O) which is not found in the other layers. This is found to be enough to read on the limitations of claim 1 since it is not required that the first and second layers do not contain any of the same materials, only that the second layer contains a material not found in the first.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RUSSELL J. KEMMERLE III whose telephone number is (571)272-6509. The examiner can normally be reached on Monday through Thursday, 7:00-5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on 571-272-1189. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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